

<b>PURWANCHAL UNIVERSITY</b>	
<b>VII SEMESTER FINAL EXAMINATION-2004</b>	
<b>LEVEL : B. E. (Electronics &amp; communication)</b>	
<b>SUBJECT: BEG431EC, Communication System-II</b>	
<b>TIME: 03:00 hrs</b>	<b>Full Marks: 80</b>
	<b>Pass marks: 32</b>

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Attempt ALL questions.**

- Q. [1] How does Digital communication System differ from Analog systems? Draw functional block diagram of DCS and explain the significance of each block. [2+6]
- Q. [2] Draw an over all functional block diagram of PCM System and explain each block. [8]
- Q. [3] Discuss T1 and E1 hierarchy of TDM-PCM telephony. [4+4]
- Q. [4] Define information. What are the units of Information? Derive expression which give relation between entropy and information. [2+2+4]
- Q. [5] Illustrate different method of electrical representation of binary data. Distinguish between ASK and FSK. [4+4]
- Q. [6] What is power spectral Density? Derive expression, which relates Autocorrelation function and psdf. [2+6]
- Q. [7] Drive expression for SNR of synchronous detector of DSB-SC signal. [8]
- Q. [8] What is Optical Fiber Communication? Explain with neat diagram. What is single mode and multimode communication in optical fiber? [4+4]
- Q. [9] What is Match filter? Show what happen when rectangular pulses is applied to the match filter. [3+5]
- Q. [10] What is Nyquist sampling theorem? Discuss sampling Theorem for Band pass signal. [2+6]

<b>PURWANCHAL UNIVERSITY</b> <b>VII SEMESTER FINAL EXAMINATION-2005</b> <b>LEVEL : B. E. (Electronics &amp; communication)</b> <b>SUBJECT: BEG431EC, Communication System-II</b> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span><b>TIME: 03:00 hrs</b></span> <span><b>Full Marks: 80</b> <b>Pass marks: 32</b></span> </div>
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**Attempt any FIVE questions.**

- Q. [1] [a]** State Sampling theorem. Show analytically that an analog signal can be completely described by its samples when sampling frequency is greater than or equal to twice of the Bandwidth. [2+6]
- [b]** Define Quantization. Derive the expression for average quantization noise and signal to quantization noise and signal to quantization noise ratio. [2+6]
- Q. [2] [a]** Explain about E1 hierarchy with necessary diagrams. [7]
- [b]** A message source generates one of four messages randomly every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.1. Each emitted message is independent of the other messages in the sequence. [3+3]
- [i]** What is the source Entropy?
- [ii]** What is the rate of information generated by this source (in bits per second)?
- [c]** A Communication Channel of Bandwidth 75Khz is required to transmit binary data at a rate of 0.1 Mb/s using raised cosine pulses. Determine the roll off factor ( $\alpha$ ). [3]
- Q. [3] [a]** Explain the demodulator system of Binary Frequency Shift Keying (FSK). [7]
- [b]** A Delta Modulation (DM) system is designed to operate at 3 times the Nyquist rate for a signal with a

3Khz bandwidth. The quantizing step size is 250 mV. Determine maximum amplitude of a 1 KHz input sinusoid for which the delta modulator does not show slope overhead. [4]

**[c]** Write the application of MODEM for data transmission and reception. [5]

**Q. [4] [a]** Derive the noise equivalent bandwidth of a low pass RC filter. [7]

**[b]** What do you understand by threshold effect in F.M? Explain in short. [3]

**[c]** Compare binary Amplitude Shift Keying (ASK) and binary Phase Shift Keying (PSK) in terms of error probability, data rate, digital bandwidth, input SNR. [6]

**Q. [5] [a]** Explain about convolution code for error detection and correction. [4]

**[b]** Write the advantages of CDMA over TDMA. [4]

**[c]** Explain in detail the concept of wireless Local Loop (WLL) technology. [8]

**Q. [6] Write Short notes on: (any TWO): [2×8=16]**

**[a]** Pulse Width Modulation.

**[b]** Differential Phase Shift Keying.

**[c]** Global Mobile Personal Communication System.

**[d]** Shannon's Channel Capacity Theorem.

<b>PURWANCHAL UNIVERSITY</b> <b>VII SEMESTER BACK-PAPER EXAMINATION-2005</b> <b>LEVEL : B. E. (Electronics &amp; communication)</b> <b>SUBJECT: BEG431EC, Communication System-II</b> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span><b>TIME: 03:00 hrs</b></span> <span><b>Full Marks: 80</b> <b>Pass marks: 32</b></span> </div>
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**Attempt any FIVE questions.**

- Q. [1] [a]** What do you mean by the term Information in digital communication System? Explain. [4]  
**[b]** What do you mean by aliasing effect? How does it occur? [4]  
**[c]** Explain the principal and working operation of different PCM techniques with necessary block diagrams. [8]
- Q. [2] [a]** Differentiate uniform quantization and non-uniform quantization. [5]  
**[b]** Explain the reconstruction method (any one) of a sampled PAM waveform. [6]  
**[c]** Compare DM and PCM. [5]
- Q. [3] [a]** What is Multiplexing? Explain the principal of TDM system. [6]  
**[b]** State and Explain Shannon's channel capacity theorem. [5]  
**[c]** A computer puts out binary data at rate of 56 kilobits per second. The computer output is transmitted using a base band binary PAM system that is designed to have a raised cosine pulse spectrum. Determine the transmissions bandwidth required for the roll-off factor  $\alpha = 0.5$ . [5]
- Q. [4] [a]** Explain the modulator and demodulator system in Binary Amplitude shift keying with necessary diagrams. [8]

- [b]** Show that the DPSK detector in the receiver reproduces the original binary sequence despite the  $180^\circ$  phase reversal in the channel. [8]
- Q. [5] [a]** What are the effects of Noise in Analog and Digital Communication system? Explain. [4]  
**[b]** Explain about the Matched filter as an optimum detector of a pulse in presence of white noise. [6]  
**[c]** Define signal to noise ratio. Compare DCS-SC, DSC-AM and SSB in terms of noise performance and bandwidth. [1+5]
- Q. [6] [a]** Explain linear block coding for error detection and correlation. [6]  
**[b]** Describe about the cellular mobile communication technology in brief. [7]  
**[c]** Write short notes on optical fibers.

**PURWANCHAL UNIVERSITY**  
**VII SEMESTER FINAL EXAMINATION-2006**

**LEVEL** : B. E. (Electronics & communication)

**SUBJECT:** BEG431EC, Communication System-II

**TIME:** 03:00 hrs

**Full Marks:** 80

**Pass marks:** 32

*Candidates are required to give their answers in their own words as far as practicable.*

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**Attempt any FIVE questions.**

- Q. [1] [a]** Draw an overall functional block diagram of a Digital Communication system and explain the significance of each block. [8]  
**[b]** Explain the three basic operations in PCM system. A PCM system is to have a signal to noise ratio of 40dB. The signals are speech, and a rms-to-peak ratio of -10dB is allowed for. Find the number of bits per code word required. [3+5]
- Q. [2] [a]** Derive the expression for signal to Quantization Noise Ratio (SQNR) in Delta Modulation (DM). [6]  
**[b]** Explain E1 hierarchy of TDM-PCM telephony. [4]  
**[c]** Define the terms message and information. Mention the conditions for  $I(m_k)$  to represent information content of  $m_k$  message on the basis of their probabilities of occurrence. [6]
- Q. [3] [a]** What do you mean by Inter Symbol Interference (ISI). Explain Nyquist pulse shaping criteria for zero ISI. [1+7]  
**[b]** What is M array signaling ? Show that it can transmit data  $\log_2 M$  times faster than binary system under similar conditions . Here M is possible levels. [3+5]
- Q. [4] [a]** Explain the carrier recovery circuits in PSK system. [6]  
**[b]** A digital signal utilize 8-bit code words. Calculate the probability of a received code words containing three

errors, given that the bit-error probability in transmission is 0.01. [4]

**[c]** Explain Frequency Shift Keying (FSK) with the help of block diagram. [6]

- Q. [5] [a]** Explain the RC filtering of white noise and derive the expression of pdf and auto correlation (AC) function of the output noise. [8]  
**[b]** Compare DSB-SC , DSB-AM and SSB in terms of noise performance and bandwidth. [8]
- Q. [6] [a]** What are the different techniques used for error control ? With reference to error detection and correction codes, define the following parameters for a code which consists of two codes: C1 = 11111 and C2= 00000. [8]  
**[i]** Weight of a code word.  
**[ii]** Hamming distance between the code words.  
**[iii]** Minimum Hamming distance of the code.  
**[iv]** Error correction capacity of the code.
- [b] Write short notes on (any TWO): [2×4=8]**  
**[i]** GSM Architecture.  
**[ii]** Limitation of Shannon's channel capacity theorem.  
**[iii]** Threshold effect in FM.

<p align="center"><b>PURWANCHAL UNIVERSITY</b></p> <p align="center"><b>VII SEMESTER FINAL EXAMINATION-2007</b></p> <p><b>LEVEL</b> : B. E. (Electronics &amp; communication)</p> <p><b>SUBJECT:</b> BEG431EC, Communication System-II</p> <p align="right"><b>Full Marks:</b> 80</p> <p align="right"><b>Pass marks:</b> 32</p> <p><b>TIME:</b> 03:00 hrs</p>
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**Attempt any FIVE questions.**

- Q. [1] [a]** Derive an expression for the output SNR for a synchronous detection of standard AM. Explain what do you mean by threshold effects? [6+2=8]
- [b]** With a neat block diagram explain the working of a digital communications system. [8]
- Q. [2] [a]** Explain with a neat block diagram explain how duobinary encoding technique can be used to remove ISI? [6]
- [b]** Assume that a computer has 110 characters on its keyboard and that each character is sent by using binary words.
- [i]** What are the number of bits required to represent each character?
- [ii]** How fast can the character be sent (characters/sec) over a telephony line channel having a bandwidth of 3.2kHz and a SNR of 20 dB?
- [iii]** What is the information content of each character if each is equally likely to be sent? [1+3+2]
- [c]** Explain with a block diagram the working of a PCM transmitter. [4]
- Q. [3] [a]** Explain with a neat block diagram, explain how a QPSK system works? [6]
- [b]** Explain with a block diagram the carrier recovery circuit in PSK system using a square circuit. What do

you mean by 180 degrees phase ambiguity problem?  
How can it be avoided? [3+1+3]

- Q. [4] [a]** With a block diagram explain how TDM system works. [6]
- [b]** Derive an expression for the probability of error for synchronous detection of BPSK. [7]
- [c]** Define Noise Equivalent Bandwidth for a filter. Find the noise equivalent bandwidth of a low pass RC filter. [2+4]
- Q. [5] [a]** What do you mean by a matched filter? List its important properties. [1+3]
- [b]** Why error control coding or channel coding is used in digital communications system? Explain with an example how a convolution encoder works. [2+4]
- [c]** Mathematically explain linear prediction. How human speech can be coded at a very low bit rate using analysis synthesis technique? Explain with a suitable model of a human speech production system. [2+4]
- Q. [6] [a]** With a neat block diagram explain the operation of an optical fiber communications system. Briefly mention the properties and types of sources, fiber and detectors used in the design of an optical fiber communication system. [6]
- [b]** What are the salient features of a cellular mobile communications system? Compare GSM and CDMA technologies for the implementation of the cellular mobile communications system. [3+3]
- [c]** What do you mean by granular noise and slope overload noise for a delta modulated system? Find the step size delta required to prevent slope overload noise for the case when the input signal is sine wave.

<b>PURWANCHAL UNIVERSITY</b> <b>VII SEMESTER BACK-PAPER EXAMINATION-2007</b> <b>LEVEL : B. E. (Electronics &amp; communication)</b> <b>SUBJECT: BEG431EC, Communication System-II</b> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span><b>TIME: 03:00 hrs</b></span> <span><b>Full Marks: 80</b> <b>Pass marks: 32</b></span> </div>
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**Attempt any FIVE questions. [5×16=80]**

- Q. [1] [a]** What are the advantages of digital communication system over analog communication system? Explain. [5]
- [b]** State and explain Nyquist Sampling theorem for both baseband and bandpass signals. Explain, aliasing with relevant frequency domain plot. [6]
- [c]** Distinguish between PWM and PAM with relevant time domain diagram. [5]
- Q. [2] [a]** Explain Q-noise and slope overload noise in DM. How they can be minimized? [5]
- [b]** Derive an expression for SQNR for a uniformly quantized PCM. [6]
- [c]** Explain mathematically what is meant by linear prediction? How speech can be coded at a very low bit rate using analysis synthesis technique. [5]
- Q. [3] [a]** Explain the TDM hierarchy for both European and North American system with relevant data rates. [6]
- [b]** Explain Inter Symbol Interference. Explain Nyquist's criteria for zero ISI. What are the drawbacks of these criteria? [5]
- [c]** What is Shannon's channel capacity theory? What are its limitations? [5]
- Q. [4] [a]** Define information and entropy of a digital message source. For a binary source, prove that the entropy  $H$  is

maximum when the probability of sending a binary 1 is equal to the probability of sending a binary 0. [5]

**[b]** Compare binary and M-ary digital modulation schemes. [5]

**[c]** Draw the transmitter and receiver for a DPSK system and explain the operation with an example. [5]

**Q. [5] [a]** What are the applications of modems for data transmission and reception over telephone lines? Explain. [4]

**[b]** Distinguish between white Noise and Thermal noise. What is the value of psd for a white noise? [6]

**[c]** What is matched filter? Show that a matched filter is also an optimum filter i.e. it maximized the SNR. [6]

**Q. [6] [a]** Drive an expression for probability of error for BPSK. [4]

**[b]** Define with an example the following parameters for an  $(n,k)$  block code: [4]

**[i]** Hamming Weight of a code word.

**[ii]** Hamming distance between two code word.

**[iii]** Minimum Hamming distance of a code.

**[iv]** Error detection capacity of a code.

**[v]** Error correction capacity of a code.

**[vi]** What is the code rate of the code?

Block code  $(n,k)$  such that  $n=4$  and  $k=1$  is under consideration such that  $C_1=0000$  and  $C_2=1111$ .

**[c]** What do you mean by WLL? Why WLL is preferred over land-line systems for the deployment of telephone systems by the operators in Nepal? What are the different technologies available for the implementation of WLL? Explain the operation of any one of them. [1+2+2+3]

<b>PURWANCHAL UNIVERSITY</b>	
<b>VII SEMESTER FINAL EXAMINATION-2008</b>	
<b>LEVEL : B. E. (Electronics &amp; communication)</b>	
<b>SUBJECT: BEG431EC, Communication System-II</b>	
<b>TIME: 03:00 hrs</b>	<b>Full Marks: 80</b>
	<b>Pass marks: 32</b>

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**Attempt FIVE questions.**

- Q. [1] [a]** Draw a neat block diagram of a PCM system and explain them in brief. [8]  
**[b]** Draw the block diagram of digital communication systems. Explain the function of each block. Why digital communication system is better than analog communication system? [3+3+2]
- Q. [2] [a]** State sampling theorem. How can we recover original message from its sample values? Explain with necessary mathematical derivations. What is aperture effect? [2+5+1]  
**[b]** Discuss about T1 Hierarchy of TDM-PCM telephony. [4]  
**[c]** Given a data stream 110101, sketch the transmitted sequence of pulses for each of following line codes. [4]  
 (i) Unipolar signaling (ii) Polar signaling  
 (iii) Bipolar signaling (iv) Manchester Code.
- Q. [3] [a]** Derive the expression of Nyquist's criteria for distortion less base band binary transmission. [8]  
**[b]** Discuss about the binary FSK system. [5]  
**[c]** A communication channel of bandwidth 75 kHz is required to transmit binary data at rate of 0.1 Mbps using raised cosine pulses. Determine the value of roll of factor. [3]

- Q. [4] [a]** Explain the Binary Frequency shift Keying, its mathematical representation, and block diagram of its modulator. Explain its synchronous and asynchronous detection. [8]  
**[b]** A discrete source emits one of five symbols per millisecond. The symbol probabilities are  $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}$  respectively. Find the symbol rate, source entropy and information rate. [5]  
**[c]** What do you mean by threshold effect in FM? [3]
- Q. [5] [a]** Find the bit error probability in baseband data communication using Pulse Amplitude Modulation. [8]  
**[b]** Prove that the maximum signal to noise ratio for the matched filter is found to be  $(SNR)_{\max} = 2E/N_0$  [4]
- Q. [6] [a]** Derive the expression for the noise performance of an amplitude modulation system using envelop detector. [8]  
**[b]** Write short notes on any TWO: [2×4=8]  
 (i) GSM architecture.  
 (ii) Shannon's channel capacity theorem.  
 (iii) Convolution code.

<b>PURWANCHAL UNIVERSITY</b>	
<b>VII SEMESTER CHANCE EXAMINATION-2009</b>	
<b>LEVEL : B. E. (Electronics &amp; communication)</b>	
<b>SUBJECT: BEG431EC, Communication System-II</b>	
<b>TIME: 03:00 hrs</b>	<b>Full Marks: 80</b>
	<b>Pass marks: 32</b>

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**Attempt FIVE questions.**

- Q. [1] [a]** What are the components of digital communication system? Explain their function. [8]  
**[b]** Explain briefly the advantages of digital communication system. [4]  
**[c]** State Nyquist Sampling Theorem. [4]
- Q. [2] [a]** Explain the generation and detection of FSK signal. [6]  
**[b]** Explain the basic procedures involved in pulse Code Modulation. [5]  
**[c]** Define PSK. Why cannot PSK signal be demodulated non-coherently? [2+3]
- Q. [3] [a]** What do you understand by companding? Why is it necessary? List the popular companding methods with their input output relationship. [6]  
**[b]** A message source generates six different symbols with probabilities 0.145, 0.15, 0.16, 0.17, 0.18, 0.195 respectively. Find  
**(i)** The information content of each symbol.  
**(ii)** The entropy of the source.  
**(iii)** The information rate, if the symbols are generated at the rate of 8000 symbols per second. [3+1+1]  
**[c]** What is correlative coding? How can the drawback of error propagating in duo binary encoding be rectified? [5]

- Q. [4] [a]** Differentiate between the block codes and convolutional codes for error detection and correction. [8]  
**[b]** Explain the behavior of envelop detector in the presence of noise. (Low noise case only). Describe Threshold effect in AM. [8]
- Q. [5] [a]** Explain in detail, the operation of satellite communication systems. [8]  
**[b]** Define Matched filter. Derive the expression for the impulse response of the matched filter. [8]
- Q. [6] [a]** Explain the concept of Wireless Local Loop and GMPCS. [8]  
**[b]** Write short notes on any TWO: [2×4=8]  
**(i)** Linear Prediction theory.  
**(ii)** CDMA.  
**(iii)** Application of Modems.